

D117: 7.1 Formulation of linear programming problems

Example 1: Sandwich Stuff

Jean-Michel's Deli makes sandwiches using bread and meat. Assume that each small sandwich uses 5 inches of bread and 4 ounces of meat, and that each large sandwich uses 12 inches of bread and 7 ounces of meat. Assume also that the Deli has on hand each day 95 feet of bread and 25 pounds of meat. Assume also that the profit on each small sandwich is \$1.10 and the profit on each large sandwich is \$1.50. How many sandwiches of each size should the Deli make in order maximize its profit? *Formulate a linear programming problem to solve this problem, how many variables, how many constraints (both implicit and explicit), and how many objective functions should you have?*

Example 2: Hiker Wannabe

Tristan is going on a "hike". He is planning his trail food, which includes a snack mix of peanuts and raisins. Each day he wants 600 calories and 90 grams of carbohydrates from this mix. Each gram of raisins contains .8 gram of carbohydrate and 3 calories and costs 4 cents. Each gram of peanuts contains .2 gram of carbohydrates and 6 calories and costs 5 cents.

Formulate the mathematical problem. What do we want to maximize or minimize and what are the constraints?

Example 3: Cruising

A cruiseline offers one-week cruises using three ships, the Nina, the Pinta, and the Santa Maria. Assume that the Nina has 540 regular cabins and 180 deluxe cabins; that the Pinta has 410 regular cabins and 450 deluxe cabins; and that the Santa Maria has 820 regular cabins and 490 deluxe cabins. Assume also that during the season there will be a demand for 11800 regular cabins and a demand for 7000 deluxe cabins. Assume also that the cost of operating the Nina for a week is \$96000, that the cost of operating the Pinta for a week is \$121000, that the cost of operating the Santa Maria for a week is \$189000. For how many weeks should each ship be scheduled in order to meet the demand at minimum cost?

Formulate a linear programming problem to solve this problem, how many variables, how many constraints (both implicit and explicit), and how many objective functions should you have?

Example 4: Flowers

A greenhouse operator plans to bid for the job of providing flowers for the city parks. He will use tulips, daffodils, and flowering shrubs in three types of layouts. Assume that each Type 1 layout uses 32 tulips, 16 daffodils, and 5 flowering shrubs; that each Type 2 layout uses 12 tulips, 44 daffodils, and 6 flowering shrubs; and that each Type 3 layout uses 24 tulips, 46 daffodils, and 5 flowering shrubs. Assume also that the greenhouse operator has on hand 1140 tulips, 940 daffodils, and 96 flowering shrubs. Assume also that the profit on each Type 1 layout is \$90.00, the profit on each Type 2 layout is \$30.00, and the profit on each Type 3 layout is \$75.00. How many layouts of each type of should the greenhouse operator plant in order maximize its profit?

Formulate a linear programming problem to solve this problem, how many variables, how many constraints (both implicit and explicit), and how many objective functions should you have?